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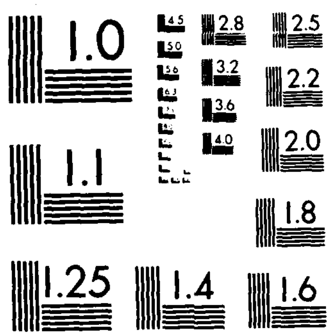
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...UDY ON SOFT CONTACT LENS WEAR
...LITARY TRANSPORT AIRCRAFT

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Contact lens wear as an alternative to spectacles for the correction of refractive errors in USAF aircrewmembers remains a controversial issue. Military transport aircrew must contend with reduced oxygen levels (typical cabin pressures of 5,000 to 8,000 ft), low relative humidity (10-15%), cigarette smoke, and fatigue and stress on long missions. Ten subjects wearing soft contact lenses and 6 control subjects not wearing contact lenses were evaluated visually and with a slit lamp onboard a C-5 aircraft on a routine mission to PACAF. Soft contact lens wearers noted no significant loss of visual acuity or contrast sensitivity during the flights. Some measures of corneal physiological stress (conjunctival injection, tear debris, etc.) were evaluated in both contact lens wearers and controls. Lens dehydration from the low relative humidity may have been the primary cause of the corneal physiological stress in the contact lens wearers. The results indicate that although there are increased physiological stresses on the cornea in the aircraft environment, there was not sufficient degradation in visual performance or lens comfort to preclude soft contact lens wear in military transport aircraft. Keywords:

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A FIELD STUDY ON SOFT CONTACT LENS WEAR IN USAF MILITARY TRANSPORT AIRCRAFT

INTRODUCTION

The correction of refractive errors in United States Air Force (USAF) aircrewmembers is a significant problem because 20% of pilots and 50% of navigators require spectacles to fly (1). The use of contact lenses as an alternative to spectacles for correcting refractive errors in aircrewmembers remains a controversial issue. Contact lens wear in military aviation is an attractive concept since contact lenses are universally compatible with life-support systems, personal protective devices, and helmet-mounted target sights. However, there are valid concerns about their safe integration into environments of high gravitational forces, low atmospheric pressures, reduced oxygen levels, and low humidity. Military transport aircrews must also contend with other negative factors such as cigarette smoke in the cabin, fatigue and stress on long missions, and irregular sleep periods.

Although the effect of positive acceleration ($+G_z$) on contact lenses is more germane to high-performance aircraft, soft lenses have performed safely in the centrifuges of many laboratories, including our own where we tested them up to +8 G_z (2-6). Soft contact lenses do not appear to have the same problem with central bubble formation that Jaeckle (7) and Newsom (8) found with hard, non-gas permeable lenses at altitudes above 10,000 ft. Flynn et al. (9) reported bubble formation under soft lenses as low as 6,000 ft, but the bubbles were located at the periphery of the lens near the limbus and had no effect on visual acuity or corneal integrity. Such peripheral bubble formation should have little consequence for crewmembers in military transport aircraft, as their typical cabin pressures are equivalent to altitudes of 5,000 to 8,000 ft, which are well below the altitude where most bubbles are observed (4,7,8,10).

There have been a number of anecdotal reports regarding discomfort with soft contact lens wear aboard longer commercial flights (11-14). Debate continues on whether the discomfort is due to a lowered O_2 partial pressure (109 mmHg at 10,000 ft), the typical 10-15% relative humidity of the aircraft cabin, cigarette smoke, or a combination of all these factors. Studies by Eng et al. (10, 15) suggest that low humidity is the major contributing factor in soft lens discomfort; however, Hapnes (16) demonstrated the same lens discomfort and physiological stress at an altitude of 18,000 ft with higher relative humidities of 41-43%. Flynn et al. (17,18) found that a combination of altitude (10,000 ft) and low relative humidity (5%) had no effect on visual acuity or contrast sensitivity, but their subjects did show a significant increase in physiological stress. They also described physiological stress as an increase in tear debris, conjunctival injection, and corneal epithelial staining. Data from Andrasko and Schoessler (19) suggest that hydrophilic lens dehydration in low humidity, which reduces oxygen availability to the cornea, may cause lens discomfort and physiological stress.

Flynn (20), in preliminary testing in C-130 aircraft, found that visual acuity in both controls and contact lens wearers remained 20/20 during all phases of the flights, although both groups experienced an increase in line fluctuations (i.e., 20/17 - 20/20) during each flight. He also noted that the contact lens fitting characteristics did not change during flight, but there was a trend towards an increase in conjunctival injection in the contact lens wearers.

The United States Air Force prohibits the use of contact lenses by aircrewmembers except for the clinical study group monitored at the USAF School of Aerospace Medicine. This study group consisted of 54 aircrewmembers with medical waivers for contact lens wear (21).

The purpose of this field test was to document the in-flight performance of soft contact lens wear onboard USAF transport aircraft. The field test evaluated, in combination, the effects of the factors that were tested in the laboratory. Testing was integrated into a flight schedule that had physically demanding conditions of consecutive days and nights, and long flights through constantly changing time zones.

METHODS

Testing onboard the C-5 transport aircraft was accomplished during a routine Military Airlift Command (MAC) mission throughout the Pacific Air Force (PACAF). The subjects tested in this study were active duty volunteers from Brooks AFB. Sixteen subjects, from whom informed consent had been obtained, participated in the 5 "flight legs" of the mission. Ten subjects were regular wearers of soft contact lenses of various designs and water contents (Table 1). These 10 subjects were designated the contact lens group. The control group consisted of the other 6 subjects who were not contact lens wearers. The experiment was conducted over 6 consecutive days and nights of flying (Fig. 1 for itinerary). Relative humidity (measured with a digital humidity analyzer) ranged between 10% and 15% on all flights.

Soft contact lens performance was evaluated by monitoring the subjects at designated intervals for the following: monocular visual acuity with the Armed Forces Vision Test Apparatus-Near and Distance (VTA-ND); photopic contrast sensitivity with the Vistech near charts; vision clarity and eye/lens awareness assessments graded by the subjects; and slit-lamp examination (Fig. 2) for determining lens fitting characteristics (movement in mm), conjunctival injection, and amount of tear debris. Mesopic contrast sensitivity and glare performance were also measured using the Rodenstock Nyktometer.

Due to sometimes constraining flight conditions, the subjects were not measured at all times for all flights. Thus, subsets of the measurement intervals were combined into 5 time periods for statistical analysis. Data collecting intervals were grouped into the appropriate time periods to make the most efficient use of available data, while still permitting comparisons of data over time spans of interest (Table 2). Daily means were computed for

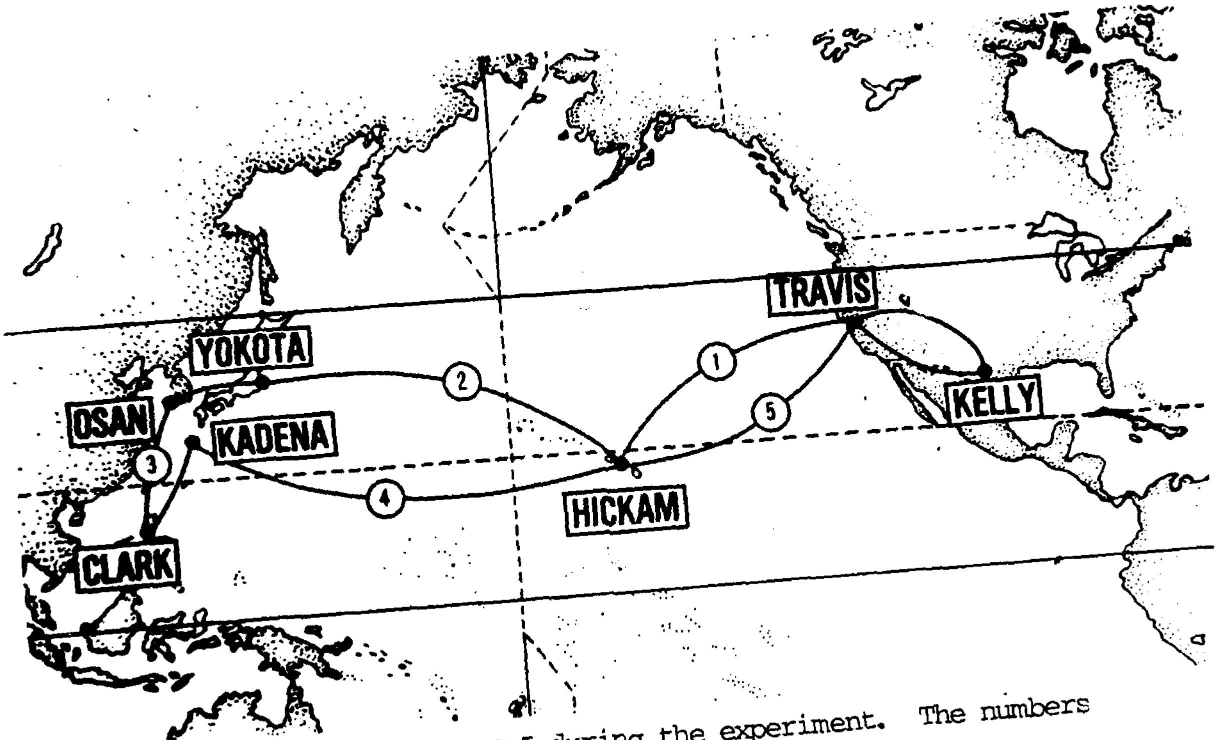

Figure 1. Route taken by the C-5 during the experiment. The numbers represent flights when data was taken.

Figure 2. Slit-lamp examination in the back of a transport aircraft during flight.

each time period and used as the basic data for the purpose of analysis. Nyktometer testing was done only at the beginning and end of each flight; thus, these time periods are different from the other eye tests.

	For Nyktometer (hours)		For Other Eye Tests (hours)
Pre	0-2 into the flight	Pre	0 into the flight
		1st	2 into the flight
Early	3-5 into the flight	Early	3-4 into the flight
		Mid	5-6 into the flight
Late	6-8 into the flight	Late	7-8 into the flight

Since some flights were shorter than other flights, statistical analyses that would include all flight days and all time periods simultaneously were not possible. Therefore, analyses were performed on subsets of the data using as many time periods and flight days as possible. The time periods and flight days included in each analysis are:

Time Periods	Flight Days	Analysis Run
Pre, 1st, and Early	1, 2, and 5	1
Pre, Mid, and Late	2, 3, and 4	2
Pre, 1st, Early, Mid, Late	2	3

Visual acuity, contrast sensitivity, and Nyktometer measurements (with and without glare) were taken on each eye separately. The data from only the "better eye" were included in the analysis. "Better eye" was defined as the eye having the best visual acuity during the Pre period on Day 1 for each subject. If both eyes were the same, the right eye was defined as the "better eye." Contrast sensitivity was measured at 5 frequencies: 1.5, 3, 6, 12, and 18 cycles per degree (cpd). In the statistical analysis, each frequency was studied separately. A repeated-measures analysis of variance (ANOVA) was used to evaluate the statistical significance of the main effect and interactions of the group (control vs. contact), time periods, and flight days' effects for runs 1 and 2. For Nyktometer measurements, unpaired t-tests were used to compare contact lens wearers and nonwearers for each of the time periods.

The other eye tests which included eye/lens awareness, vision clarity, conjunctival injection and tear debris, were graded using the following scale:

0 = Normal	2= Severe
1 = Minimal	3= Extreme (Stop Testing)

For these tests, the Wilcoxon 2-sample test was used to compare contact lens wearers and nonwearers. The other eye test variables were also categorized into either NORMAL or NOT NORMAL (minimal, severe, or extreme), and the

chi-square test for differences in probabilities was used to compare wearers and nonwearers. In this report, such terms as statistically significant or significant difference use the criterion alpha < .05.

RESULTS

The test results involving visual acuity measurements with the VTA-ND were not statistically significant for any of the 3 runs. Generally, both soft contact lens wearers and controls experienced a slight decrease in visual acuity as the flights progressed. Table 3 summarizes the near-visual acuities for each group during the 3 runs.

The analysis-of-variance results for contrast sensitivity are summarized in Table 4 for runs 1 and 2. The group means at the designated times for each frequency are presented in Tables 5A-B. A significant 3-way interaction of groups, days, and times (p-value = .02) was detected at 1.5 cpd during run 1 (pre, 1st, early). On day 1, the contact lens group showed a rise in contrast sensitivity at this frequency while the control group noted a decrease; however, this pattern was not present for days 2 and 5. For run 2 (pre, mid, late), the contact lens group again demonstrated a statistically significant (p-value = .02) rise in contrast sensitivity over time at 1.5 cpd vs. the control group which showed a decrease. Although not statistically significant, this general pattern prevailed for all frequencies of run 2 except 6 cpd (note Fig. 3). The increase of contrast sensitivity in the contact lens wearers was counter to what might have been expected. All test results for run 3 were not significant. The means are shown in Table 5C.

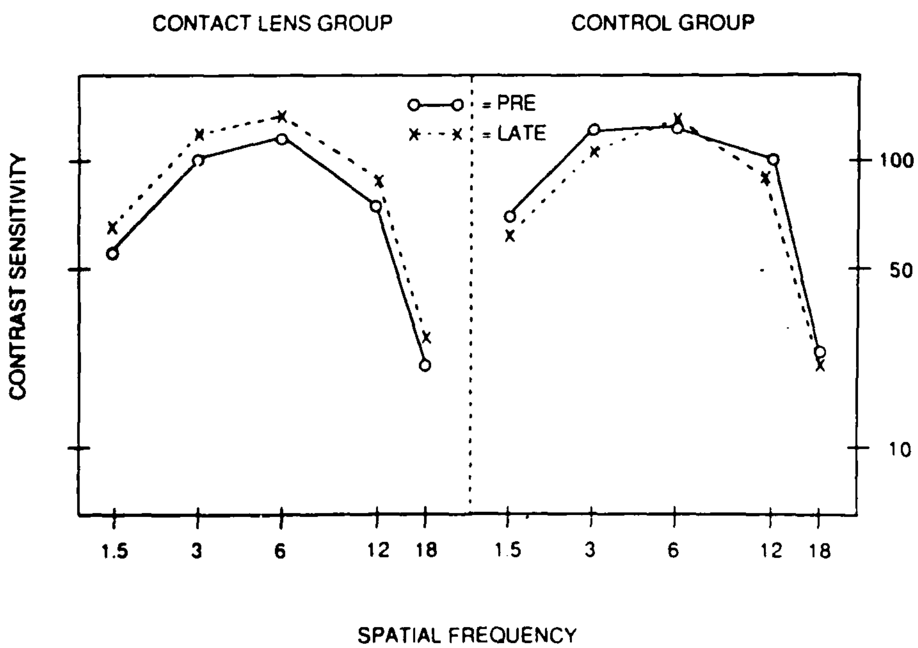

Figure 3. Contrast sensitivity functions for the contact lens and control groups comparing Pre and Late (6-8 h) time periods for Run 2. Spatial frequency is in cycles/degrees.

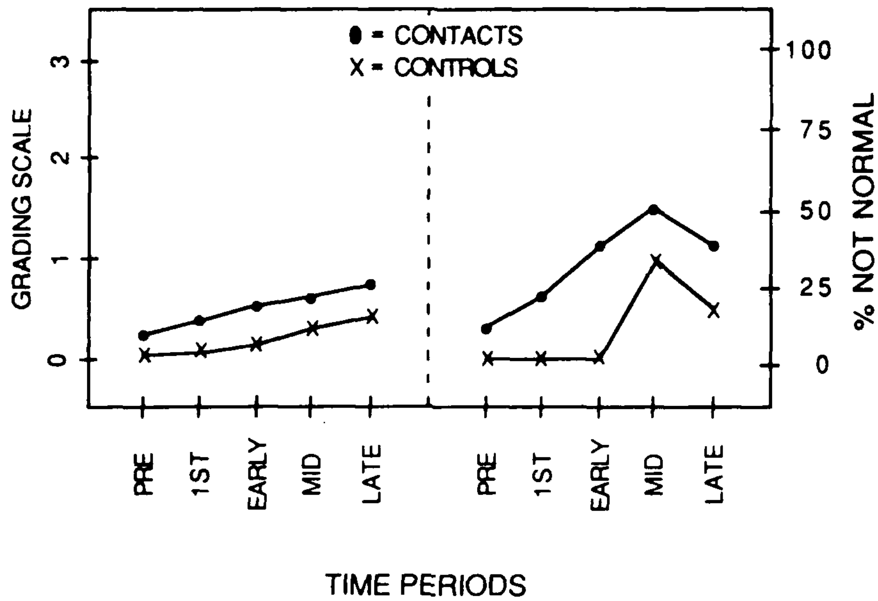

Figure 4. Mean changes and percentage of "not normal" measurement changes in eye/lens awareness during the designated time periods.

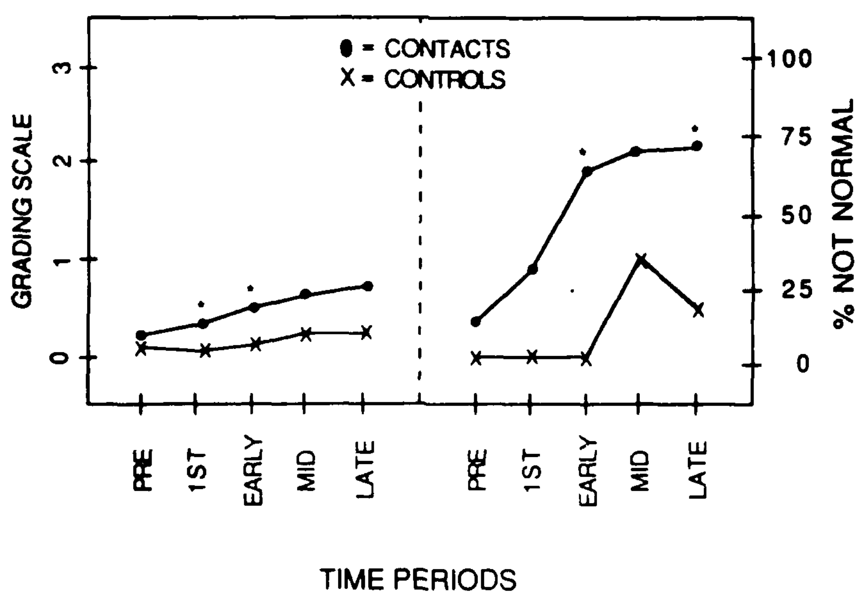

Figure 5. Mean changes and percentage of "not normal" measurement changes in subjective vision clarity during the designated time periods.
* indicates a significant difference between groups ($p < .05$).

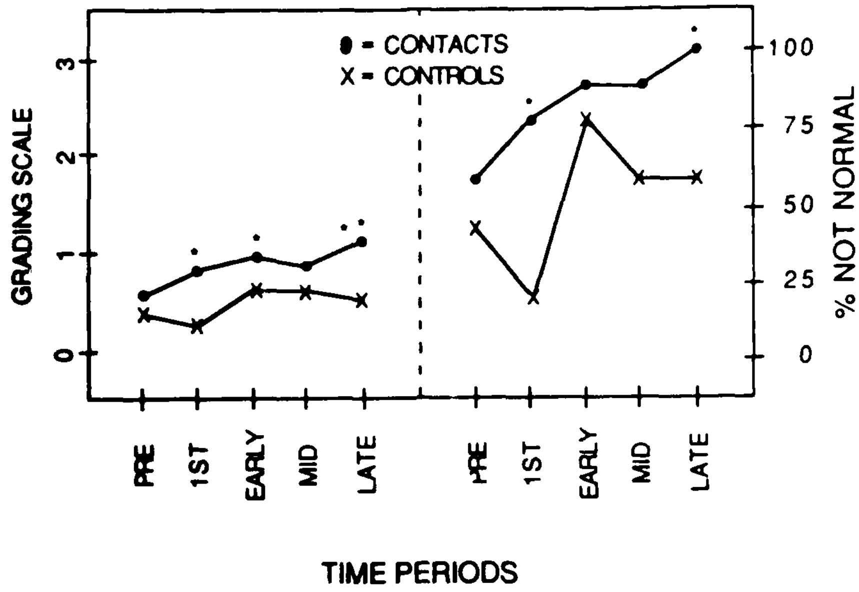

Figure 6. Mean changes and percentage of "not normal" measurement changes in conjunctival injection during the designated time periods. *indicates a significant difference between groups ($p < .05$). ** denotes a highly significant difference ($p < .01$).

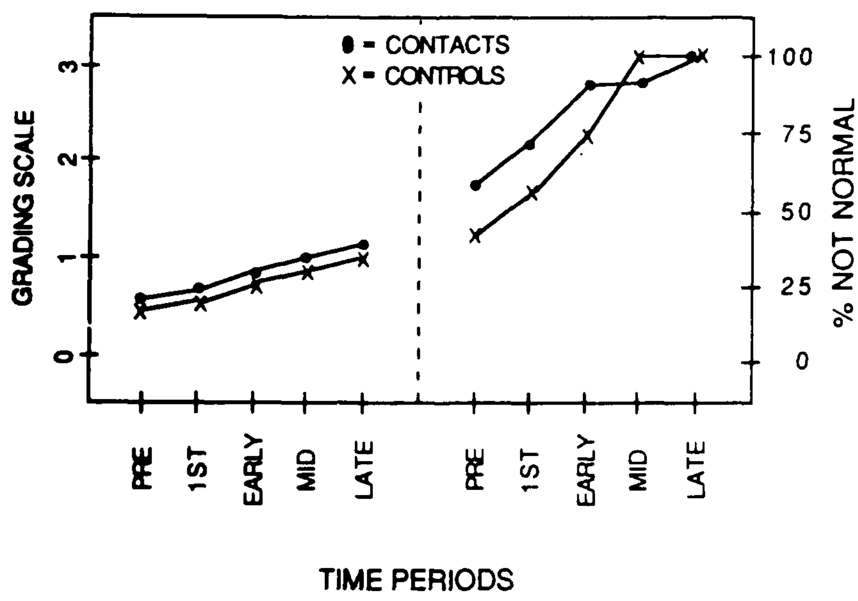

Figure 7. Mean changes and percentage of "not normal" measurement changes in tear debris during the designated time periods.

There was no statistically significant difference in mesopic contrast sensitivity with the Nyktometer between contact lens wearers and the control group. As expected, the sample means for the Nyktometer measurements without the glare source were higher for both groups than with the glare source (Table 6). There was a rise in means over time for both groups, with and without the glare source, which was probably indicative of a learning curve.

Subjective eye/lens awareness was not amplified significantly with soft contact lens wear as the flights continued, although both groups reported a trend toward more eye/lens awareness and a greater percentage of "not normal" ratings (those reporting minimal, severe, extreme on the scale) (Fig. 4). On the other hand, there were statistically significant differences in subjective vision clarity. The contact lens wearers noted a decrease in subjective vision clarity early into the flight (time periods 1st and early, $p < .05$), while the percentage of soft contact lens wearers reporting not normal ratings was significant in both the early and late time periods ($p < .05$, Fig. 5 and Table 6).

The most significant difference between the two groups involved the measurement of conjunctival injection (Fig. 6 and Table 6). The contact lens wearers experienced a highly significant ($p < .01$) increase during the late period (7-8 h into the flight), and 100% of them measured "not normal" in the late time frame. The amount of tear debris measured was not significantly different between the two groups. The most interesting finding in this category was that by the end of the flight, 100% of both groups had "not normal" tear debris measurements (Fig. 7 and Table 6). However, even though all the graded responses appear high on the "not normal" scale (Figs. 4-7), the majority of the "not normal" responses were at the minimal level.

DISCUSSION

Crewmembers on military transport aircraft have unique concerns with soft contact lens wear. Their missions are long, and they are challenged with less than ideal environmental and travel conditions. This study combined the aerospace factors examined in our laboratory along with additional factors such as cigarette smoke, crew fatigue, long hours, and changing time zones. It is important to note that this study was not done with actual crewmembers, but with subjects that were inexperienced in flying and not conditioned to long rigorous missions. Additionally, data was taken in the passenger cabin of the C-5 and not in the cockpit.

Some groups have already reported successful contact lens wear in the aerospace environment. The Federal Aviation Administration (FAA) has allowed its aircrewmembers to wear contact lenses for the correction of distance vision since 1976.* The FAA does not feel that contact lens wear for distance correction constitutes a significant safety hazard (22). A number of military transport crewmembers in the clinical contact lens study group at USAFSAM are performing well with hard and soft contact lenses (21).

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* Correction with bifocal contact lenses or with monovision is not allowed by the FAA.

Visual acuity, as measured by the VTA-ND, was minimally affected by the environmental variables throughout the study whether or not soft contact lenses were worn. As each flight progressed, both groups experienced a slight decline in visual acuity, which was probably due to the evaporation of tears at the corneal surface or contact lens dehydration.

Lens dehydration in the 10-15% relative humidity environment of the aircraft was again the most likely reason for the significant decline in subjective visual clarity in the contact lens wearers. Not only does dehydration of the contact lens reduce the oxygen flow to the cornea, it apparently steepens the base curve and creates a tighter fit (15, 19). Our data on lens movement, although not statistically significant, suggest a trend toward a tighter fit over time (Table 6). Other evidence of a tightening of the lens fit and corneal hypoxia was presented by the prevalence of conjunctival injection in the contact lens group.

Since conjunctival injection is often associated with corneal edema, one wonders whether corneal edema, if present, would be directly caused by a reduced level of available oxygen at this altitude or secondarily to the product of low relative humidity of the aircraft cabin-contact lens dehydration? A pressurized cabin altitude of 5,000 to 8,000 ft is well below the maximum edema-free altitudes predicted by Flynn for the soft contact lenses worn in this study (18). However, another measure of physiological stress that we used in the study, tear debris, is indicative of a lack-of-tear flushing or low humidity-related dry eye syndrome (23). It could be argued then that tear debris, which increased during the flights in 100% of the subjects irrespective of contact lens wear (Fig. 7), was due to the drying effect at the corneal surface from the low relative humidity.

Normally, one would expect a decrease in contrast sensitivity with lens dehydration and a loss in subjective visual clarity; however, this was not the case. The contact lens wearers generally improved at the tested frequencies, while the control group decreased in sensitivity. Perhaps the level of physiological stress on the cornea was not sufficient during the flights to affect visual acuity and contrast sensitivity significantly. The subjects reported that their lenses remained relatively comfortable, as measured by eye/lens awareness (Fig. 4), throughout the flight.

The results of this study suggest that, although there are increased physiological stresses on the cornea in the aircraft environment, there was not sufficient degradation in visual performance or lens comfort to obviate soft contact lens wear in military transport aircraft. No flying time was lost by any subject due to a corneal abrasion or an uncomfortable lens, although Flynn reported one minor corneal abrasion necessitating contact lens removal in a subject on a preliminary flight (20). It should be noted that this study was a one-time event for our subjects. Aircrewmembers would experience prolonged and repeated exposure to soft contact lens wear in the aerospace environment. Therefore, it would be judicious for aircrewmembers to reduce any controllable factor that has a negative impact on lens comfort and corneal integrity, such as smoking and poor lens-care hygiene. Since lens dehydration from low relative humidity appears to be the major difficulty with

wearing soft contact lenses in this environment, it may be important to keep the lenses as hydrated as possible. Eng (24) suggests that the use of artificial tears designed for soft lenses may have the greatest efficacy for lens comfort over the long term. Successful soft contact lens wear would still not preclude the need for a pair of spectacle lenses as a back-up system for visual correction.

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TABLE 1. SOFT CONTACT LENSES WORN DURING FIELD STUDY

Subjects	Lens
4	55% H_2O Bufilcon A
3	71% H_2O Perfilcon A
2	42.5% H_2O Tetrafilcon A
1	37.5% H_2O Tefilcon
10	

TABLE 2. DATA COLLECTED DURING FLIGHT

	Time Periods							
	Pre	1st	Early		Mid		Late	
Flight Day	0	2	3	4	5	6	7	8
1	x	x	x	x				
2	x	x		x		x		x
3	x				x		x	
4	x			x		x		x
5	x	x		x				

TABLE 3. VISUAL ACUITY MEANS USING BEST EYE

Run 1 (Flight Days 1, 2, 5)

Group	#Subj	Pre	1st	Early
Contact	10	20.7	20.0	21.5
Control	6	17.6	18.3	18.7
Overall		19.2	19.2	20.1

Run 2 (Flight Days 2, 3, 4)

Group	#Subj	Pre	Mid	Late
Contact	10	20.2	21.3	21.9
Control	6	19.5	19.1	20.2
Overall		19.8	20.2	21.1

Run 3 (Flight Day 2)

Group	#Subj	Pre	1st	Early	Mid	Late
Contact	10	21.2	19.2	21.1	21.2	21.7
Control	6	17.7	17.7	16.8	16.8	19.0
Overall		19.5	18.4	19.0	19.0	20.3

TABLE 4. CONTRAST SENSITIVITY

		ANOVA Table and P Values for Each Frequency				
Source	DF	1.5	3	6	12	18
		Run 1-- Pre, 1st, Early				
Group (Contact vs. Control)	1	N.S.	N.S.	N.S.	N.S.	N.S.
Error	12					
Days (1, 2, 5)	2	.06	.04	N.S.	N.S.	.09
Group by Days	2	N.S.	N.S.	N.S.	N.S.	N.S.
Error	25					
Times (Pre, 1st, Early)	2	N.S.	N.S.	N.S.	N.S.	N.S.
Group by Times	2	.09	N.S.	N.S.	N.S.	N.S.
Error	25					
Days by Times	4	N.S.	N.S.	N.S.	N.S.	N.S.
Group by Days By Times	4	.02	N.S.	N.S.	N.S.	N.S.
Error	53					
		Run 2-- Pre, Mid, Late				
Group (Contact vs. Control)	1	N.S.	N.S.	N.S.	N.S.	N.S.
Error	12					
Days (2, 3, 4)	2	.04	N.S.	N.S.	N.S.	N.S.
Group by Days	2	N.S.	N.S.	N.S.	N.S.	N.S.
Error	26					
Times (Pre, Mid, Late)	2	N.S.	N.S.	N.S.	.004	N.S.
Group by Times	2	.02	N.S.	N.S.	N.S.	N.S.
Error	26					
Days by Times	4	N.S.	N.S.	N.S.	N.S.	N.S.
Group by Days By Times	4	N.S.	N.S.	N.S.	N.S.	N.S.
Error	54					

TABLE 5A. MEANS FROM ANALYSIS OF CONTRAST SENSITIVITY DATA USING BEST EYE

(Run 1--Flight Days 1, 2, 5)

Group	#Subj	Pre	1st	Early
		Frequency = 1.5		
Contact	10	57.7	60.6	62.2
Control	6	67.2	66.0	64.1
Overall		62.4	63.3	63.1
		Frequency = 3		
Contact	10	106.0	106.7	108.8
Control	6	109.5	106.9	117.0
Overall		107.7	106.8	112.9
		Frequency = 6		
Contact	10	119.0	115.4	130.4
Control	6	141.5	135.9	135.4
Overall		130.2	125.6	132.9
		Frequency = 12		
Contact	10	80.2	77.4	82.6
Control	6	92.6	80.5	92.5
Overall		86.4	79.0	87.5
		Frequency = 18		
Contact	10	26.9	24.6	25.3
Control	6	28.3	29.9	30.1
Overall		27.6	27.3	27.7

TABLE 5B. MEANS FROM ANALYSIS OF CONTRAST SENSITIVITY DATA USING BEST EYE

(Run 2--Flight Days 2, 3, 4)

Group	#Subj	Pre	Mid	Late
		Frequency = 1.5		
Contact	10	57.4	58.0	61.3
Control	6	67.7	65.9	61.2
Overall		62.6	62.0	61.2
		Frequency = 3		
Contact	10	108.7	111.3	110.9
Control	6	117.6	121.4	108.4
Overall		113.2	116.4	109.6
		Frequency = 6		
Contact	10	123.5	126.5	126.7
Control	6	135.7	139.4	143.7
Overall		129.6	132.9	135.2
		Frequency = 12		
Contact	10	84.1	75.4	85.2
Control	6	99.3	86.6	94.2
Overall		91.7	81.0	89.7
		Frequency = 18		
Contact	10	26.0	25.8	26.5
Control	6	29.2	32.6	28.8
Overall		27.6	29.2	27.6

TABLE 5C. MEANS FROM ANALYSIS OF CONTRAST SENSITIVITY DATA USING BEST EYE

(Run 3-- Flight Day 2)

Group	N	Pre	1st	Early	Mid	Late
				Frequency = 1.5		
Contact	10	60.2	64.4	62.0	64.4	66.2
Control	6	69.0	62.0	69.0	66.8	63.8
Overall		64.6	63.2	65.5	65.6	65.0
				Frequency = 3		
Contact	10	106.3	112.0	114.0	110.8	111.5
Control	6	120.5	119.3	126.7	127.8	106.8
Overall		113.4	115.7	120.3	119.3	109.2
				Frequency = 6		
Contact	10	113.6	120.3	124.6	122.7	125.9
Control	6	133.0	135.2	137.0	137.0	137.0
Overall		123.3	127.7	130.8	129.8	131.4
				Frequency = 12		
Contact	10	77.6	72.2	76.2	75.3	86.1
Control	6	99.8	90.7	94.5	91.5	90.7
Overall		88.7	81.4	85.3	83.4	88.4
				Frequency = 18		
Contact	10	22.7	25.0	22.6	24.6	26.8
Control	6	30.7	30.7	30.2	32.3	28.7
Overall		26.7	27.8	26.4	28.5	27.7

TABLE 6. LENS PERFORMANCE DATA

Times	Contact Mean (N=10)	Control Mean (N=6)	P Value Test 1	Contact Percent Not Normal	Control Percent Not Normal	P Value Test 2
			Eye/Lens Awareness			
Pre	.24	.03	N.S.	10.0%	0.0%	N.S.
1st	.41	.06	N.S.	20.0	0.0	N.S
Early	.56	.15	N.S.	40.0	0.0	N.S.
Midway	.63	.28	N.S	50.0	33.3	N.S.
Late	.73	.33	N.S.	40.0	16.7	N.S.

Vision Clarity

Times	Contact Mean (N=10)	Control Mean (N=6)	Test 1	Contact Percent Not Normal	Control Percent Not Normal	Test 2
Pre	.20	.10	N.S.	10.0%	0.0%	N.S.
1st	.33	.06	<.05	30.0	0.0	N.S.
Early	.55	.12	<.05	60.0	0.0	<.05
Midway	.67	.28	N.S	70.0	33.3	N.S.
Late	.77	.28	N.S.	70.0	16.7	<.05

Injection (Redness)

Times	Contact Mean (N=10)	Control Mean (N=5)	Test 1	Contact Percent Not Normal	Control Percent Not Normal	Test 2
Pre	.60	.36	N.S.	60.0	40.0	N.S.
1st	.83	.27	<.05	80.0	20.0	<.05
Early	.96	.68	<.05	90.0	80.0	N.S.
Midway	.90	.67	N.S	90.0	60.0	N.S.
Late	1.10	.53	<.01	100.0	60.0	<.05

TABLE 6. LENS PERFORMANCE DATA (Continued)

Times	Contact Mean (N=10)	Control Mean (N=5)	P Value Test 1	Contact Percent Not Normal	Control Percent Not Normal	P Value Test 2
			Lens/Tears			
Pre	.58	.48	N.S.	50.0%	40.0%	N.S.
1st	.68	.60	N.S.	70.0	60.0	N.S.
Early	.88	.78	N.S.	90.0	80.0	N.S.
Midway	1.00	.87	N.S.	90.0	100.0	N.S.
Late	1.10	1.07	N.S.	100.0	100.0	N.S.

Nyktometer Without Glare
Best Eye

Times	Contact (N=10) Mean (Std Dev)	Control (N=6) Mean (Std Dev)	P Value
Pre	0.49 (0.14)	0.45 (0.16)	N.S.
Early	0.48 (0.12)	0.42 (0.10)	N.S.
Late	0.43 (0.08)	0.39 (0.10)	N.S.

Nyktometer With Glare
Best Eye

Times	Contact (N=10) Mean (Std Dev)	Control (N=6) Mean (Std Dev)	P Value
Pre	0.74 (0.15)	0.68 (0.30)	N.S.
Early	0.71 (0.20)	0.62 (0.27)	N.S.
Late	0.73 (0.16)	0.61 (0.26)	N.S.

Fit of Contact Lenses (mm)
Time Periods

Eye	Pre	1st	Early	Midway	Late	P Value
OD (Right)	.700	.692	.681	.683	.575	N.S.
OS (Left)	.741	.825	.766	.717	.658	N.S.

END
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